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THE RELEVANCE OF WILLINGNESS-TO-PAY ESTIMATES OF' THE VALUE OF A STATISTICAL LIFE IN DETERMINING WRONGFUL DEATH AWARDS

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INTRODUCTION

There is a fairly extensive literature in economics concerning the dollar amount individuals are willing to pay (or dollar compensation they are willing to accept) to obtain a small reduction (increase) in the risks of fatal injury. From the results of these studies it is possible to calculate an average dollar value per statistical life using the average change in risk and the average dollar value for this change in risk.

These willingness-to-pay studies have been widely reviewed for their potential applicability in evaluating government regulations involving changes in (small) risks across a given population group (see, for example, Violette and Chestnut 1983 and Fisher et al. 1989). Although the use of benefit-cost analysis to evaluate policies aimed at protecting human life remains somewhat controversial, most economists agree (with various qualifications) that these types of "value of life" estimates are the appropriate dollar values to use in this type of benefit-cost analysis.

Recently, willingness-to-pay (WTP) estimates have found their way into legal cases involving compensation for wrongful death, and questions are being raised about the appropriateness of the use of these estimates in this new area (see Miller 1989). This specific issue has not been widely addressed in the economics literature, but is important because compensation amounts in wrongful death cases are being decided by the courts every day, and any insight that the economics literature might add to this difficult process would be helpful. What underlies the difficulty faced by the courts is that most parties agree that compensating survivors for only their financial loss is not adequate. Compensation on these grounds does not provide the right incentives for accident prevention, and it does not seem fair to claim that directly provable financial losses fully compensate the parties that have suffered an intense, personal loss with its attending grief (although in some instances compensation for financial losses is all that the law allows). Even with these compelling reasons, putting a dollar value on the non-financial loss is very difficult. The willingness-to-pay estimates seem appealing because we know they reflect more than just the potential financial loss involved in the risk of death. Whether they are an appropriate measure.of fair compensation in the case of a wrongful death is another question.

This paper presents the key issues that underlie this question and discusses the theoretical and empirical information available in the economics literature. The answer to this question is not a simple yes or no. It is a conditional maybe in some circumstances, with remaining uncertainties that cannot be resolved without further empirical research. What is critical is identifying the purpose or intent of the wrongful death award and contrasting this with what is reflected in the WTP estimates that have been obtained in economic studies. There are some potentially important differences between the WTP estimates and the legal definitions of compensation that apply in wrongful death cases, but the courts are having to make dollar decisions on these awards everyday and our intent in this paper is to explore whether the WTP estimates might provide any positive information that would be helpful in this process.

WRONGFUL DEATH COMPENSATION

A wrongful death case typically involves an accidental or premature death of an individual that can be attributed to a specific cause. Depending on the specific laws that apply, obtaining compensation from an identified responsible party may or may not require demonstration of negligence on the part of the responsible party. Often a two-step process is involved First, a determination regarding negligence is made, including potential contributory negligence on the part of the deceased. The result of this determination is an assignment of a percentage of responsibility for the death to the defendant. Second, a total dollar amount of compensation is determined to which the percentage assigned to the defendant is applied The focus of this paper is on the second step of this process, the determination of the total dollar payment that would be an appropriate compensation for the loss associated with the death of the individual. This can be treated as independent of any determination of negligence.-

The purpose of wrongful death compensation is not unambiguous. There are legal statutes that define what the compensation should reflect, when a wrongful death has been determined, and these vary from state to state. There are also social welfare theories that suggest levels of compensation that would further various social goals, such as the optimal provision of accident prevention efforts. These often are very different from the legal requirements. This paper considers the following five definitions of compensation which are often used in the law or in the economics literature:'

Alternative Definitions of Compensation

1. replacement of financial support lost to survivors due to premature death

2. a dollar measure of all support lost to survivors including financial support, household and childcare services, companionship, parental guidance, moral support, love, etc.

3. a dollar measure of the full loss in utility (well-being) to survivors including item (2) and any additional pain and suffering (grief) due to the loss of a loved one

4. compensation to the decedent's estate for the loss of income and enjoyment of life; essentially a dollar measure of the loss in utility (well-being) to the deceased

5. a dollar measure of the value of a (statistical or unidentified) human life to the individual at risk, which includes financial and non-financial factors as well as concerns of the individual regarding the potential effect of his or her death on survivors

[1] Awards in wrongful death cases sometimes also include punitive damages, but this involves a different purpose than compensation and is not the focus of this paper.

The first three categories are various definitions of what it might mean to "compensate" survivors. Item (3) defines a dollar measure of the total loss to survivors in the event of a premature death. Items (1) and (2) are subsets of item (3), each excluding some part of the loss. Item (1) is a fairly straightforward concept although uncertainty exists because it is necessary to estimate the future earnings that are lost because of the premature death. There is general agreement that immediate family members of the deceased (typically spouses, children, and sometimes parents) should be compensated at least this amount, but some disagreement exists as to whether the amount that would have been spent on consumption by the deceased should be excluded; and on whether and how to quantify lost household and childcare services. Still, current techniques used to estimate this component of compensation are probably adequate. However, it is clear that the financial aspect alone, however it is measured, probably understates the total loss to survivors due to an individual's premature death.

Statutes in some states define compensation as in item (2). For example, California statutes define compensation to victims (dependents) in the case of wrongful death of an individual to include loss of financial support, loss of "love, companionship, comfort, affection, society, solace or moral support," and where applicable, loss of enjoyment of sexual relations and physical assistance in the operation and maintenance of the home.[2] Consideration of pain and suffering related to grief is specifically excluded. The California statutes also give specific definitions of who is to be compensated: generally this includes only spouses, natural and adopted children, and parents of minor children.

Item (3) is more of a welfare economics definition of compensation, although it is similar to that defined by law when pain and suffering of survivors as well as their loss of financial and non-financial support are to be considered. In welfare economics, the formal definition of compensation is the change in income that would restore the survivors to their previous (pre-accident) levels of utility (or well-being). This would include compensation for all financial and non-financial losses to all the survivors affected by the death.

Item (4) defines a measure of the loss to the deceased individual. Miller (1989) notes that wrongful death compensation statutes in several states allow for compensation to the decedent's estate for lost enjoyment of life, along with compensation for lost productivity. In this case the loss is measured in terms of the loss to the deceased, with the estate standing as the representative, rather than in terms of the loss to the survivors.

The fifth category defines the value of a statistical life used in the economics literature. Interpreting this as an appropriate measure of compensation in the case of a wrongful death is related to a concept of economic efficiency, which is widely discussed in the economics literature (see for example, Viscusi 1983), but is not necessarily the primary concern in the legal arena. Some analysts hypothesize that improving economic efficiency is an underlying

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[2] This is taken from California Jury Instructions, Civil, prepared by the Committee on Standard Jury Instructions, Civil, Superior Court of Los Angeles County, California, West Publishing Co., St. Paul, MN, 1986.

social goal behind the laws allowing for compensation to survivors in wrongful death cases (see for example, Brown 1973), but this is not explicitly stated in the laws themselves. This definition of compensation focuses on the deterrent effect that requiring payment of compensation will have on those who have an influence on the amount of risk to which others are exposed.

The first four definitions of compensation are all ex post in nature in that they involve some measure of a loss that has already occurred. Although the fifth definition is also for a payment after an accident, the magnitude is determined by the conditions that existed before the accident (ex ante conditions). This is because the intent of the fifth definition is to provide incentives for an optimal allocation of resources to accident prevention. The implications of the differences between the ex ante and ex post perspectives are discussed in a later section of the paper.

WILLINGNESS-TO-PAY ESTIMATES FOR CHANGES IN FATAL RISKS

The willingness-to-pay studies attempt to estimate the change in income for an individual that is equivalent in terms of a change in utility (well-being) to a change in the individual's risk of fatal injury. To make this more concrete, we will focus on analyses of the wage-risk trade-off. Wage-risk trade-offs are the most common contexts in which such values are believed to be revealed. Wage-risk studies attempt to estimate the additional amount of wages that must be paid for individuals to accept jobs with greater risks of fatal injury. This compensation is ex ante because it is paid before a potential accident has occurred. Abstracting from the limitations of the empirical estimation procedures (which are not trivial, but are not the focus of this discussion), economic welfare theory indicates that the estimates obtained with this analysis can be expected to reflect the expected value (loss) to the individual of an increased risk of his or her own death. This can be expected to include the following components:

1. potential loss in one's own utility in the event of one's own death, including the loss in expected utility of future consumption, loss of utility derived from living independent of consumption, and any disutility (pain and suffering) associated with the death itself

2. potential loss in one's own utility due to the potential financial loss to survivors in the event of one's death

3. potential loss in one's own utility due to the utility loss for survivors due to loss of one's companionship, love, moral support, parental guidance, etc.

The potential loss in one's own utility in the event of death is at least equivalent to the present value of future consumption that would be lost. For an individual with no financial dependents, it could be expected that component (1) would be greater than or, at the very minimum, equal to the present value of expected future income of the individual. For an individual with financial dependents, some of the expected future income would have benefited the dependents, thereby spreading the present value of one's future income across components (1) and (2).

A potential increase in willingness to pay when there are dependents may occur due to component (3). Cropper and Sussman (1988) refer to this as a potential "family existence effect" and provide very preliminary empirical evidence that such an effect exists. They define the family existence effect as utility the individual derives from the existence of other family members that is independent of their consumption. The individual may also be concerned about the potential effect of his or her death on other relatives and friends who may not be financially dependent, but who share some companionship and love. .

Looking from the employer's point of view, the "value of life" is the risk premium that he must pay (spread across all employees) in order to operate in circumstances when there is an average risk of one death per year per X number of employees. This risk premium raises the wages he must pay, compared with an otherwise equivalent job with a lower risk of fatality. The employer will have incentives to reduce risks to employees to the point where the costs per life saved of accident prevention efforts just equal the value per life lost he must pay (in higher wages).

Fisher et al. (1989) summarize the range of results found in the most credible wage-risk studies to date and conclude that the most credible results fall between $1.6 and $8.5 million per statistical life saved. Miller (1990) has conducted a similar review and drawn somewhat different conclusions, suggesting a most credible range of $1 to $3.1 million per statistical life saved. Risks of death on the job are typically around one per year per 10,000 workers. A value per statistical life of $3 million. means that each worker is being compensated an average of $300 per year for accepting a risk of death of .0001 per year. It is important to note that these ranges of $160 to $850 and of $100 to $310 are ranges in the average compensation required for this level of risk for the samples of workers used in the studies. These studies do not tell us how any one individual, either in these samples or in other groups in society, might need to be compensated to accept this level of risk; nor do they tell us how much compensation would be required, on average, for workers to accept substantially higher levels of risk.

When a worker accepts this "risk premium," the implied value per statistical life might be interpreted as an implicit value the individual is putting on his or her life in this context, but this interpretation is subject to some specific assumptions. The most important assumption behind this interpretation is that the risk premium is related to the expected value of the potential loss. Using the example of a $300 risk premium for a .0001 risk of death, $300 is the expected value of a .0001 risk of a potential loss of $3,000,000. It is not clear that the average person responds to risks in this way, and in fact there is some evidence that the expected value of a potential loss is not a very good predictor of the value an individual places on the potential for even a simple financial loss (see Violette and Chestnut 1983, Chapter 5). In addition, even if the expected value is an acceptable interpretation of the risk premium, we do not know whether the implicit value of life is the same when different kinds of risks or different levels of risks are involved.

COMPARISON BETWEEN WRONGFUL DEATH COMPENSATION AND WILLINGNESS-TO-PAY ESTIMATES

In this section of the paper we discuss differences between wrongful death compensation and the willingness-to-pay (WTP) estimates that are relevant for most or all of the potential compensation definitions.

Survivors Versus Deceased

The most striking difference between the first three potential definitions of wrongful death compensation and the WTP estimates is that the former concern the effect of a death on the survivors, while the latter concern the change in utility for the individuals facing a risk of death. While concern for survivors (especially dependents) is expected to be a factor in determining the compensation an individual would require to accept a given risk of fatal injury, concern for self is expected to be an important, if not the most important, factor. Further, it is not just a matter of subtracting the component of the WTP estimate attributable to concern for self (which is not likely to be a simple empirical task in any case), because the effect of a change in a dependent's utility is not necessarily associated with a one-to-one change in the individual's utility. If we assume; however, that the family is a utility maximizing unit and that the individual's decisions regarding employment reflect the family's utility function, then the WTP estimate can be expected to exceed the utility loss to the dependents, because it includes the value the individual places on his or her own potential loss as well as on the potential loss to dependents.

Ex Post Versus Ex Ante Co-

The estimates obtained in the WTP studies are ex ante values, meaning that they are based on conditions in existence before the potential accident. Wrongful death compensation is ex post because it occurs after the accident has happened. This difference might affect the level of compensation that would be required, depending on how compensation is defined.

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[3] This is a point on which we disagree with Johnson's (1989) interpretation of the WTP estimates. He references Fisher et al. (1989) as the source of his information on the WTP estimates and proposes a certain interpretation of these estimates for use in determining wrongful death compensation. Johnson argues that because the accident victim is not known when the individual makes the employment or other risk accepting decision and because the risk to the individual is very small, the WTP estimates reflect the value of protecting some other (unidentified) person's life rather than the individual's own. This contradicts the standard interpretation of the WTP estimates in the economics literature, which is that they reflect the individual's concern for his or her own safety in the face of some probability of a fatal accident. The fact that the probability of an accident is small does not change this. The basic premise of welfare economics is that individuals act to maximize their own utility.

Viscusi (1983) defines two measures of compensation, and argues that the difference between these two measures is related to differences in the ex ante and ex post marginal utility of income. One definition of compensation is the amount that restores everyone to their original (pre-accident) level of utility. Viscusi suggests that the amount of compensation that would restore the original utility is related to the WTP estimates from wage-risk studies. However, he does not fully address potential differences between the WIT estimates and a measure of compensation that would restore original utility, when the accident involves something more than a financial loss (as a wrongful death certainly does).

If only a financial loss is involved, the level of compensation that would restore the original level of utility is an amount equivalent to the financial loss. In this circumstance, there is no significant difference expected between ex ante and ex post compensation. The risk neutral individual will be indifferent between being compensated before the potential accident by the expected value of the loss (the magnitude of the potential loss multiplied by the probability of the loss occurring) or being compensated after the accident by the amount of the loss. However, the WTP estimates and the wrongful death compensations concern a situation where the loss involves substantially more than money. In this situation, it is not an appropriate interpretation of the WTP estimate to say that a payment of the implied value of a statistical life in the event of an accidental death will restore the pre-accident level of utility. After death, it is impossible to compensate the individual for the loss of his or her own life and it is unlikely that there is any amount of money that would restore the spouse, children, or parents to their pre-accident level of utility. Thus, we would argue that while there may be a finite ex ante compensation that would restore the pre-risk utility levels, and that this is an appropriate interpretation of the wage-risk premium, there is not likely to be any finite ex post compensation that would restore the pre-death utility levels even for survivors.

The second definition of compensation Viscusi gives is the amount of insurance individuals would have purchased ex ante if they could have insured themselves against the loss on an actuarially fair basis. He treats this as roughly equivalent to the present value of potential lost income. Viscusi says, "If there are no adverse health effects and all losses are financial, this measure is tantamount to compensation for the monetary accident costs." He argues that if there are adverse 'health effects (especially permanent disability or death), this measure will be less than the amount that would restore the pre-accident welfare level. Because the individual can be expected to derive more utility from a dollar available for consumption before the accident rather than after (especially if it is a fatal or seriously debilitating accident), the individual will not insure himself for the full welfare impact of the accident even when given the opportunity to purchase such insurance on an actuarially fair basis. Ex ante life insurance purchases, even in an actuarially fair market, are also likely to understate the potential losses to survivors in that the individual is not likely to be willing to pay to ensure financial compensation for losses for which money is a poor substitute (such as love, companionship, and parental guidance). This is one possible reason why the WTP estimates imply values per statistical lives that exceed the amount of life insurance the average person carries.

The economic definition of ex post compensation that would restore the original utility level does not appear to be a practical concept to help determine wrongful death compensations,

because in most cases there would be no finite amount of financial compensation that would do this. Much of the loss involved in a death (especially for the deceased and also to a large extent for the survivors) is something for which money is a poor substitute. The question then becomes whether ex ante measures of this potential loss, based on what people are doing to avoid it, are an acceptable or useful way to quantify the loss when it comes to determining compensation after an accident has occurred. The answer to this question is not necessarily going to be found with economic theorizing, but what we as economists can contribute to this discussion is a clear explanation of what we think is reflected in available ex ante measures of the value of reducing or avoiding risks of death, and of the assumptions and uncertainties that underlie the potential use of these estimates in wrongful death compensation determinations.

Identified Versus Statistical Individual

Another difference between wrongful death compensation and WTP estimates is often discussed in conjunction with the ex ante and ex post comparison. This is that wrongful death compensation occurs when the accident victim is known and WTP estimates are based on the situation when the accident victim is unknown. This is not really a difference between before and after the accident, but is a difference in the level of risk faced by the individual. When the individual who will be injured or killed is identified, the risk he or she faces is 100 percent. When the individual is not identified, the risk is often small, something much less than 100 percent.

In the case where the victim is known, the ex ante compensation measure for the individual at risk would be the answer to the question (however it is empirically measured): What is the minimum increase in income you would be willing to accept in order to voluntarily subject yourself to this injury (with certainty that it will occur)? With an answer to this question we could say with some confidence that the individual is indifferent between receiving this payment before or after the injury occurs and that this amount would restore the original level of utility if paid in Compensation after the accident. When dealing with an injury that involves only a financial loss, this is all quite reasonable, but it becomes a bit ridiculous when dealing with a fatal injury, or even a seriously debilitating one. The question then becomes: What is the minimum increase in inheritance for your survivors that you would accept in order to voluntarily be killed? We guess that most people would say (and would behave in a way that would reveal) that there is no such amount.

What this means is that there is no way to fully compensate the deceased in the case of a wrongful death. The California statutes seem to recognize this in focusing on the surviving dependents of the deceased and excluding consideration of any pain and suffering the deceased may have experienced. However, even if we focus on the loss in utility of the survivors we have a similar difficulty in the case of an identified injury victim. The ex ante question then becomes: What is the minimum increase in income you would be willing to accept in order to voluntarily allow your loved one to be killed? Again, we would expect that most people would feel that there is no such amount. The parallel ex post question would be: What is the minimum increase in income that would make you feel as well-off as you felt before your loved one died? This question relieves the survivor of responsibility for the death, but still would probably not have a finite answer for most people.

In reality, life is a risky business and everyone faces death one way or another. In day to day living, therefore, it is routine that people make trade-offs between income (and utility in general) and risks of death. This is quite natural and unavoidable. What we have in the wage-risk studies is an estimate of the average amount an individual must be compensated in wages in order to voluntarily accept an increased risk of fatal injury. That we can take the change in income and multiply it by the change in risk of death and come up with a dollar per statistical life number does not mean that this is the amount that would compensate the individual or anyone else for that individual's death. Violette and Chestnut (1983) have suggested that it would be reasonable that this dollar per statistical life number would vary with the level of risk involved, but this has not been firmly established empirically. The presumption is that the necessary compensation will increase more rapidly than the acceptable risk and will approach infinity as the risk approaches 100 percent. This means that there is probably not a single "value of life," although the amount of variation has not been empirically determined.

Another important difference that occurs when going from the statistical individual to the identified individual is that we go from an average across a large group to an individual. The WTP estimates are averages for the groups sampled in each of the studies in which the estimates have been obtained. In the wage-risk studies this is typically working age adult males. The WTP estimates therefore reflect average income levels, average risk aversion attitudes, and averages of other relevant characteristics for individuals in the samples. Any single individual might be quite different from the average.

WILLINGNESS-TO-PAY ESTIMATES COMPARED TO ALTERNATIVE DEFINITIONS OF COMPENSATION

In this section we compare the WTP estimates to each of the specific alternative definitions of wrongful death compensation discussed above. These comparisons abstract from the general differences discussed in the previous section. Most of these general differences apply as well for each of the individual comparisons.

Compensation Definition 1: Lost Future Earnings

Empirical estimates suggest that willingness to pay for small changes in risks of death imply values per statistical life that are an order of magnitude larger than typical lifetime earnings (on the order of a few million rather than a few hundred thousand dollars). Whether this is due to some sort of risk aversion, differences in the marginal utility of income under different states, large family existence factors, large disutility of potential pain and suffering associated with death, or some other factor has not been fully articulated in the economics literature.

Just because the average value per statistical life exceeds the average lifetime earnings does not mean, however, that expected future income is fully reflected in the WTP estimates. To the extent that an individual has insurance that would compensate dependents for their loss in income in the event of the individual's death, this potential loss would not be expected to be reflected in decisions such as whether to accept a given wage for a job with

a given risk of a fatal accident.' If the individual is fully insured, then component (2) will be zero and only that portion of future income that would have been used for the individual's own consumption would be reflected in the WTP estimates.'

We conclude that the WTP estimates do not add much useful information if the desired measure of compensation is the lost future income. Current techniques for estimating lost future income can take account of the specific characteristics of the individual, which the WTP estimates do not, and can be sure of excluding considerations other than lost future income that are also reflected in the WTP estimates.

Compensation Demon 2. Loss of All Financial and Non-Financial Support

As discussed above, it is expected that the WTP estimates will reflect the value the average individual places on the potential loss of financial and non-financial support to survivors in the event of his or her death. However, it is uncertain whether the full potential loss to survivors will be reflected in the WTP estimates. This will depend on:

1. the extent to which the potential financial loss to dependents is covered by life insurance

2. whether the individual places as much value on the potential loss of non-financial support as do the survivors

An analysis of typical life insurance coverage held by individuals sampled in wage-risk studies might yield some insight about how much of the potential financial loss to survivors

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[4] Data are probably available to empirically address this question, although we have not done so. To determine whether the average value per statistical life includes financial loss to dependents it would be necessary to find out the average amount of life insurance coverage held by individuals in the wage-risk study samples. We guess that some, but not all, of the potential financial loss to dependents is covered by insurance on average, so that the remaining potential loss is reflected in the WTP estimates.

[5] This is another point on which we disagree with Johnson's (1989) interpretation of the WTP estimates for use in wrongful death cases. He argues that the WTP estimates do not include any of the lost future income due to premature death and reflect only the "intangible" loss. He makes this claim arguing that income is not relevant because the person who will die is not identified. This makes no sense. The average WTP will reflect the average expected income loss, at least to the extent that the individual would have used this income for consumption. This component of WTP for the individual will be some portion of the potential loss (the probability of the loss faced by the individual multiplied by the magnitude of the potential loss to the individual). To say that potential lost income to dependents is not reflected in the WTP estimates requires the strict assumption that the average individual is fully insured for lost income to dependents in the event of his or her death.

might be expected to be covered elsewhere and, therefore not reflected in the WTP estimates. Whether there are significant differences between the value the individual places on the potential loss of non-financial support to survivors relative to the value the survivors would place on this potential loss is a more difficult question. This question could be explored in an interview approach for adults. Where minor children are involved, we have little recourse but to accept the assumption that the parent's decisions reflect the utility of the child.

Other factors in addition to the 'potential loss in financial and non-financial support to survivors are also expected to be reflected in the WTP estimates. If the loss of financial and non-financial support to the survivors is fully reflected in the WTP estimates, this means that the WIT estimates will overstate this loss to survivors by the amounts that reflect:

1. the value to the individual of the perceived enjoyment of the remainder of his or her expected life, including utility related to consumption and unrelated to consumption

2. the value to the individual of avoiding the potential pain and suffering that he or she would expect to experience in the event of an accidental death

3. the value to the individual of preventing the pain and suffering (grief) that the survivors would experience in the event of his or her death

It is probably a reasonable guess that the value to individuals of their enjoyment of their own lives, combined with the value of avoiding their own potential pain and suffering, accounts for a large portion of the WTP estimates. This could be explored empirically by examining differences in WTP for individuals with and without dependents. Such an examination would have to take into account differences in the way financial and non-financial potential losses to survivors might enter the WTP estimates. Separating the individuals' value for preventing the grief survivors might experience from other non-financial losses such as companionship and parental guidance would be very difficult.

We conclude that the WTP estimates are likely to overstate this definition of compensation to survivors, but that this needs to be verified empirically. There are some fairly straightforward research efforts that could reduce the uncertainty in this conclusion.

Compensation Definition 3: Total Welfare Impact to Survivors

The expected relationship between the WTP estimates and the third definition of compensation is similar to that discussed above for the second definition. The difference is that the pain and suffering (grief) experienced by the survivors is included in the third definition, bringing it closer to the WTP estimate.

We would expect that the WTP estimate will exceed the non-financial components of definition 2 and definition 3 compensations if we accept the following assumptions:

1. due to life insurance coverage, the WTP estimate reflects none of the potential financial loss to the survivors

2. expected value of the potential loss is an acceptable interpretation of the risk premium, and if not the difference is such that the WTP estimate exceeds the value of the potential loss

3. the individual does not place significantly less value on the potential loss to survivors than they would place on it for themselves

4. the individual has an average sized family and average preferences and aversions with regard to life and death

5. the relevant risk situation would have evoked the same or less reaction (required the same or less risk premium) as the situation in which the WTP estimate was observed

Our conclusions about the relationship between the WTP estimates and this definition of competition are the same as those given above for the previous definition of compensation. The only difference is that the likely overstatement is reduced because the grief related pain and suffering for survivors is included. Especially for this definition of compensation, which does not exclude any components of the loss to survivors, research concerning how the WTP estimates are affected by concern for survivors might suggest how to subtract the desired value from the WTP estimate.

Compensation Definition 4: Loss to the Deceased

Wrongful death compensation laws that allow for compensation to an individual's estate for the loss suffered by the deceased define compensation in a way that more closely matches the WTP estimates than for laws that focus on the loss to the survivors.

It is important to note that the WTP estimates can be expected to reflect the value placed by the individual on the financial and non-financial loss that survivors, especially family dependents, would experience in the event of his or her death. Without further research there is currently inadequate information to say what share of the average WTP estimate is attributable to this component of the value. It could be argued that this component should be subtracted if only the value to the individual of his or her life is the desired measure. Interdependence of utility among family members, however, makes it less than fully clear whose value this is. A reasonable case could be made that this is a loss to the deceased due to the responsibility and love he or she feels toward others.

An important distinction that needs to be made if the WTP estimates are used to bound this definition of compensation is the potential difference between the average and the identified individual. The WTP estimates give us values for the average individual, including average potential financial losses in the event of death. If the deceased is not average in terms of income, then the best way to adjust for this difference is to subtract the present value of the expected lifetime earnings for the average individual in the samples

from which the WTP estimates were obtained, possibly adjusting for the average amount of life insurance held by these individuals. The remaining dollar amount can be expected to reflect the average value of the non-financial components of the WTP estimates. If a total dollar measure of the loss for this particular individual's death is desired, then the present value of their expected lifetime earnings can be added to this non-financial component of the WTP estimate. (See Miller 1989 for an example of how this might be done.)

Compensation Definition 5: Safety Efficiency Incentives

An alternative way of viewing the social benefit of a system allowing for compensation to survivors in wrongful death cases is to consider the incentives it provides with regard to accident prevention. If we consider that society as a whole has a finite amount of resources to spend on both ex post compensation to accident victims and to ex ante accident prevention efforts, the best allocation of the resources will be that which minimizes the total cost of accidents and accident prevention to society. To reach this optimization point would mean that the total cost to society of preventing a fatality should just equal the total benefit to society when a fatality is prevented. If the responsible party must pay an amount that equals the total benefit to society when a death is prevented, then that party will have incentives to spend up to that amount on efforts to reduce the risks of fatal accidents. In this case, an ex ante measure of the benefit of preventing a fatality is appropriate.

The benefit to society when a fatality is prevented includes the benefit to the individual who is saved as well as to family members and others. The WTP estimates of value per statistical life may be a reasonable measure of the benefit to society of a preventing a fatality. This is similar to the application of the WTP estimates in the regulatory arena where they are used as a dollar measure of the average total benefit associated with the prevention of death for an unidentified individual. To the extent that potential lost income and medical expenditures are not reflected in the WTP estimates due to insurance coverage, the WTP estimate may actually understate the total benefit of preventing a fatality. The WTP estimates may also understate the total benefit of preventing a fatality to the extent that the benefits to loved ones and others are not fully reflected in the decisions made by the individual.

As economists ever interested in efficiency, we see this as a legitimate use of the WTP estimates, but this is different from the specific legal requirements related to wrongful death compensation that concern only the survivors. Changing to a consideration of the total loss to society, including the loss to the deceased individual, would require a conscious social decision to change the legal statutes related to wrongful death compensation. We think that it is this perspective that probably underlies the advocacy by some economists for the use of the WTP estimates in wrongful death compensation. Miller (1988), for example, does not specifically discuss this efficiency consideration, but does argue that standardization of the wrongful death compensation procedure by using the WTP estimates would provide potential benefits in terms of reduced litigation costs and a reduction in the wide and apparently capricious variation in awards.

CONCLUSIONS

A fundamental difference between the WTP estimates of the value of a statistical life and wrongful death compensations is that the former are ex ante measures while the latter are ex post payments. We have considered the economic definition of ex post compensation, which is the amount that would restore the pre-accident level of utility (well-being), and have concluded that this is not a very helpful concept with regard to determining wrongful death compensations because in most cases there would be no finite amount of money that would do this. We are therefore willing to consider the possibility that ex ante measures, which reflect the value individuals implicitly place on their lives when they make voluntary tradeoffs between income (or expenditures) and increased (or decreased) risks of death, may provide some positive information to help in the difficult process of determining wrongful death compensation.

We conclude that the WTP estimates are potentially useful when the definition of compensation involves putting a dollar figure on non-financial losses to the deceased or to survivors. In both cases there are some significant uncertainties about how the WTP estimates should be interpreted that could be resolved with additional empirical research. There are more uncertainties that need to be addressed when the definition of compensation focuses on the loss to survivors. When the definition of compensation involves quantifying the loss to the deceased the most important uncertainties we have identified are:

1. the stability of the implicit value of a statistical life in different circumstances

2. the amount of potential lost future income that is reflected in the average WTP estimates

3. the amount of variation in the WTP estimates associated with differences in age and other characteristics of the individual

The first uncertainty is significant because the range of circumstances for which WTP estimates are available is limited primarily to on-the-job risks and to automobile accidents. It is not known how much the implicit value of a statistical life might vary in circumstances involving different levels and types of risks of fatalities. If the value varies significantly, then we are faced with a difficult question regarding what values are relevant to a particular wrongful death case. More could be learned with further empirical research about how the WTP estimates may vary, but it would entail a considerable research effort.

The second uncertainty could be more easily addressed, at least approximately. Information on typical life insurance coverage and income levels for the samples on which the available WTP estimates are based could be used to approximate the average amount of income expected to be reflected in the estimates. Additional work confirming the hypothesized effect of insurance coverage on the inclusion of potential financial losses in the WTP estimates would be useful.

The third uncertainty concerns the variation from the average that might be expected across individuals. With more information about how WTP estimates vary with characteristics such as age, it will be easier to tailor the estimates to a specific individual.

If we focus on the definitions of compensation that concern survivors of a wrongful death, we conclude that the WTP estimates of the value of a statistical life can be expected to systematically overstate the average non-financial loss to survivors. Whether or not the WTP estimates are likely to exceed the financial and non-financial loss to survivors depends on whether the non-financial losses are overstated by more than the financial losses are understated due to the existence of insurance. This question is'something that could be answered by further empirical work along the lines discussed above, but extending the exploration to include how the WTP estimates vary with the number of dependents the individual has (including individuals with no dependents). This would give us a better idea of the size of the non-financial loss to survivors reflected in the WTP estimate.

We suspect that it may be a reasonable social choice to use WTP type estimates in determining wrongful death compensations in order to minimize the total social cost of accidents and accident prevention. However, this would require a conscious social decision to change wrongful death compensation laws, which would need to be preceded by appropriate public discussion and debate.

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